August 1962

EMO

NATIONAL DIGEST

Nuclear Fallout Measurements

Planning for Resource Evaluation

Nuclear Detonation and Fallout Reporting

Hospital Experience Programme

Emergency Fuel in Shelters

EMERGENCY MEASURES ORGANIZATION

THE EMO NATIONAL DIGEST

Published by the Emergency Measures Organization of the Privy Council Office

VOL. 2 NO. 4 AUGUST 1962

TABLE OF CONTENTS

NUCLEAR FALLOUT MEASUREMENTS (WHERE DO THEY COME FROM, WHAT DO THEY MEAN?) ..... *Sonja Sinclair*

EMERGENCY PLANNING FOR RESOURCE EVALUATION ..... *Dr. Joseph D. Coker*

NUCLEAR DETONATION AND FALLOUT REPORTING SYSTEM ..... *DSO & P, Army H.Q.*

HOME OFFICE—UNITED KINGDOM ..... *Mr. David Renton*

HOSPITAL EXPERIENCE PROGRAMME ..... *Evelyn A. Pepper*

DISPERSAL PLANS FOR ENGLAND AND WALES ..... *A Report*

EMERGENCY FUEL IN SHELTERS ..... *Dr. N. B. Hutcheon*

THE IMPORTANCE OF HOUSEHOLD FOOD STOCKPILING ..... *Emergency Supply Planning Branch*

The EMO NATIONAL DIGEST is published bi-monthly to provide current information on a broad range of subjects dealing with civil emergency planning. The magazine is published in English and French and may be obtained by writing to the Emergency Measures Organization, Privy Council Office, East Block, Ottawa.

In addition to publishing articles which reflect Canadian Government policy the Digest may also publish articles by private individuals on subjects of current interest to the emergency measures programme. The views of these contributors are not necessarily subscribed to by the Federal Government.

Director: R. B. CURRY. *Editor:* A. B. STIRLING.

ROGER DUHAMEL, F.R.S.C.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
OTTAWA, 1962

NUCLEAR FALLOUT MEASUREMENTS

Where do they come from, what do they mean ?

by

SONJA SINCLAIR

SONJA SINCLAIR is a freelance writer and broadcaster whose articles have appeared in *Chatelaine, Canadian Business, The Globe & Mail Magazine* and *Canadian Homes*. Her scripts are used regularly on the CBC's Montreal television programme *"Let's Face It"* and a one-hour radio documentary she has recorded on the teaching of languages is scheduled for broadcast on the Trans-Canada Network in September.

Mrs. Sinclair was born in Czechoslovakia and came to Canada in 1939. She is a graduate in Modern Languages from Trinity College, University of Toronto, and holds a Bachelor of Journalism degree from Carleton University, Ottawa. She is the wife of Group Captain A. Richard Sinclair, Comptroller at Air Defence Command, St. Hubert.

IN THE emotionally supercharged atmosphere of nuclear testing, facts and figures have a way of becoming either lost or twisted. It is not that factual information is difficult to come by: the Department of National Health and Welfare puts out a steady stream of charts and statistics showing the extent and nature of radioactive fallout in Canada at any given time.

But in the hands of amateurs, statistics are often made to serve anybody's pet political theory: ban-the-bombers can point to the radiation level for a carefully selected day shortly after a test explosion and cry that the human race is committing genocide.

Test-and-be-damned advocates, on the other hand, can choose an altogether different day, compare its radiation level to the much higher permissible maximum and dismiss all fear of nuclear fallout as subversive propaganda.

Both attitudes are frankly unrealistic to Dr. Peter M. Bird, the man chiefly responsible for measuring radioactive fallout in Canada. As chief of the Radiation Protection Division of the Department of National Health and Welfare, Dr. Bird is not charged with setting the maximum permissible dose of radiation a person can safely absorb; this is done by an international body of scientists, International Commission on Radiological Protection.

What Dr. Bird and his staff have done is set up an organization which will, it is hoped, detect any measurable trends in nuclear radiation in Canada; so far as they might affect the health of Canadians. "I do not," says Dr. Bird, "like the term 'health hazard'."

Whether he likes it or not, the very existence of the Radiation Protection Division obviously proves that an excessive dose of radiation is in fact considered to constitute a health hazard. Since radioactive fallout can enter the body either through the air we breathe or more likely through the water we drink and the food we eat, the Division has set up a number of apparently independent but actually interrelated projects for the analysis of air, rain water, soil, milk, wheat and finally, human bones.

Basic Facts

In order to understand the methods used in these measurements and to interpret the results with any objectivity, it is necessary to review some of the basic facts concerning radioactive fallout.

1. Fallout is not a homogeneous substance which behaves according to constant and established rules. It is in fact a mixture of some 170 radioactive isotopes with only one common characteristic: as they give off radiation, they gradually decay and become harmless. But the rate of this decay varies tremendously: the physical half-life of an element—the time it takes to reduce radioactivity to half its original strength—can range from a fraction of a second to thousands of years. From the point of view of health, isotopes with

59854-0—1

very short half-lives are of little concern; the same is true of those isotopes whose half-lives are long but which are only present in nuclear fallout in negligible quantities.

Also off the danger list are those radioactive isotopes which have no resemblance to elements normally contained in the human body, and which the body is, therefore, unlikely to assimilate. Zirconium, for instance, would probably not even be found in a food product; and if it did enter the human body, it would almost certainly be eliminated.

By this process, scientists, therefore, arrive at four isotopes which they consider potentially dangerous: strontium-90, with a half-life of 28 years and a close affinity to calcium; strontium-89, with the same chemical qualities as strontium-90 but only a 50-day half-life; and caesium-137, with a half-life of 30 years and a resemblance to potassium. The fourth isotope, iodine-131, is readily absorbed by the thyroid gland; but its half-life is only eight days and it, therefore, constitutes far less of a long-term health hazard. Any iodine-131, for instance, which might have resulted from last autumn's Russian tests would have been reduced to infinitesimal proportions before this year's spring rains.

2. The second important fact is that there are three types of fallout: local, tropospheric and stratospheric.

Local fallout consists of comparatively large particles, is rapidly deposited and affects mainly the actual area of explosion, though its cigar-shaped cloud can extend for considerable distances downwind. Local fallout is not likely to reach Canada from any test site selected by either the Russians or the Americans.

Tropospheric fallout tends to fall mainly in that latitudinal band around the earth where the weapon was exploded. It does, therefore, affect Canada, as was shown within a few days of the Russian tests when high levels of radioactivity were recorded. However, tropospheric fallout still consists of fairsized particles and is deposited within a few months.

Stratospheric fallout stays up longest and consists of the smallest particles. Since both strontium and caesium are long-lived fission products their relative concentration is greatest in stratospheric fallout as the short-lived components have had time to decay.

With these facts in mind, the Radiation Protection Division is less concerned with the total radioactive fallout registered by any one time or place than with the nature of that fallout, specifically with its content of strontium-90 and caesium-137. Nevertheless, the Division does at times, for the sake of speed and convenience, provide figures regarding total radiation activity. Such figures can be interpreted by experts in the light of all known facts and circumstances: in the hands of laymen, they are completely meaningless.

Measuring Projects

Seven measuring projects are currently operating under the Radiation Protection Division.

AIR SAMPLING. This program consists of 24 testing stations situated throughout Canada, in populated as well as Arctic regions, and operated by Department of Transport meteorologists. At each station, a blower unit passes approximately 650 cubic meters of ground level air through a high efficiency filter, four inches in diameter. The filter paper, along with detailed weather information, is sent daily to Ottawa where highly sensitive radiation counting equpiment is used to measure beta particles in the filter. (Alpha, beta and gamma are three different types of radioactive rays. Alpha and beta rays have substance; gamma rays do not.)

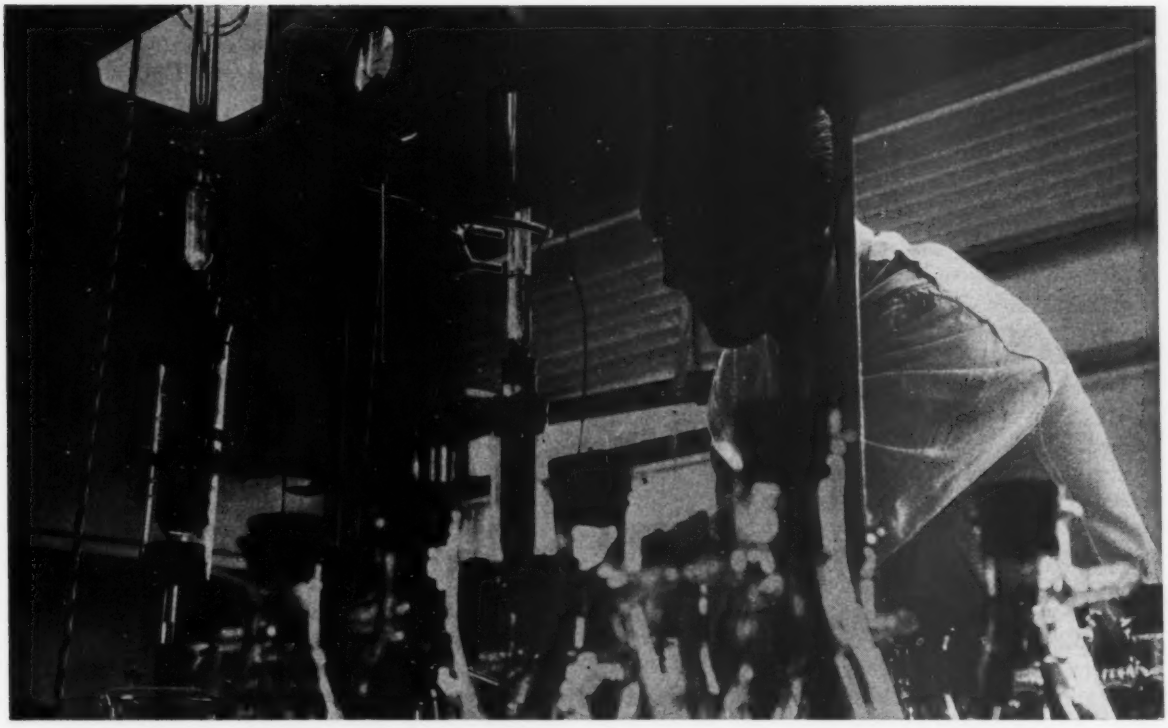
The main value of the air sampling program consists in its ability to give early warning of any sudden changes in radiation levels which might call for further investigation. However, Dr. Bird insists most emphatically that without such further analysis, the figures have no health significance. Scientists, for instance, are not overly concerned with a high level of radioactivity in the air immediately after a nuclear test, because they know that such activity is caused to a large extent by short-lived particles which will decay before they have had time to cause any harm. At the time of a nuclear explosion, strontium-90 and caesium-137 each account for 0.008% of the total radioactivity; after two weeks, each constitutes 0.04% of the total; after 120 days, 0.4%.

These facts account for some of the apparent inconsistencies in official figures. A fallout rate which is considered far from alarming a few days after a nuclear test might be considered decidedly unsafe a year later, because by then, the contribution of strontium and caesium to the total would be relatively high.

In any case, radioactive fallout in the air may be blown away without ever reaching the ground. Only the most tentative conclusions can, therefore, be drawn from the air sampling program.

PRECIPITATION SAMPLING. The same stations which operate the air sampling program are also in charge of the precipitation sampling. The equipment consists of black polythene rain pots, six inches in diameter and 18 inches high, with a polythene liner inside each pot. These collectors are placed in a supporting framework with the open end about three and a half feet above the base of the framework.

The rain pots are emptied once a month and their contents, complete with liner, are sent to the Radiation Protection Division laboratories for beta activity measurement. In certain cases, the samples are subjected to further analysis to determine the actual level of strontium-90 and caesium-137. In 1959 for instance,



NATIONAL FILM BOARD PHOTO

when radiation measurements were high, the April sample for Ottawa and the combined May and June sample for Dartmouth were so analyzed. At that time, about six months after the last nuclear tests in 1958, the strontium-90 contribution to the total beta activity was found to be about 5%.

Again, Dr. Bird cautions against misinterpretation of rain water sampling results. Rain water, he points out, is not commonly used for drinking.

Surface water contains far less radioactivity than rain water, and this activity is further reduced by filtration. In Ottawa, for instance, the strontium-90 concentration in tap water was in 1959, on an average, little more than a fiftieth of the rainwater concentration. This was just as well since the rain water concentration in Ottawa did, in April and May 1959, exceed the maximum permissible drinking water level as set by the International Commission on Radiological Protection: these levels are, of course, calculated on the basis of lifetime exposure and government officials never tire of pointing out that occasional upswings in radioactivity are relatively unimportant. In 1960, rain water radioactivity levels plunged to about one fifth of the peak 1959 figures.

As for other trends, the one apparently established fact is that radioactive fallout begins to intensify every year in the later winter and works up to a seasonal high in the late spring or early summer. This was noticeable even in 1961, some two and a half years after the last nuclear tests.

This annual upswing is not, as was previously assumed, simply related to the rainfall of any particular region. Instead, scientists now believe that there is a gap in the band of air which separates the stratosphere from the troposphere and which they call the tropopause. Through this gap, so the theory goes, winter winds drive stratospheric air into the troposphere. Radioactive fallout which would otherwise remain in the stratosphere for years, therefore, enters the troposphere during the winter and returns to earth with the spring rains.

As a result, scientists also have revised their thinking as to the estimated "residence time" of stratospheric fallout: whereas this used to be pegged at approximately ten years, it is now considered that this time may vary depending on circumstances from less than a year to several years.

SOIL SAMPLING. Twenty-two stations are involved in the Radiation Protection Division's soil sampling program which was started in 1960. At each station, a metal tube three inches in diameter is used, like a cookie cutter, to remove 20 sod patches spaced according to a predetermined pattern. Below the sod, soil is removed to a depth of six inches; it is crushed,

59854-0—2

ground and blended to ensure an average mixture, and then analyzed for strontium-90 and caesium-137 content. No results of this program are as yet available; but it is hoped that eventually, it will be possible to relate the rainfall analyses to soil content.

Relating soil content to agriculture will be more difficult since all the samples are being taken from virgin soil, undisturbed by any agricultural processes. The distribution of fallout in such soils will presumably be different from that occurring in agricultural lands which have been ploughed and fertilized. Therefore, it will not be easy to relate the soil analyses to levels in agricultural products.

MILK SAMPLING. Since milk is the primary source of calcium in our diet, the proportion of strontium to calcium in milk and milk products is an important indicator in this program. Samples of dried milk are, therefore, collected through the co-operation of the Department of Agriculture from 13 to 17 powdering plants and sent to Ottawa for laboratory analysis. Here the milk powder is ashed and the calcium and strontium extracted. Finally, the strontium-90 content is determined by radiochemical means.

Dr. Bird has hoped for some time to be able to extend the milk analysis program to include an analysis for caesium-137 content. It now seems that this will be done before the end of this year.

Until studies have been completed on the representativeness of the sampling program it is not reasonable to draw conclusions as to regional differences in milk levels. But on a national basis, figures obtained from the milk samples confirm conclusions drawn from the other programs: in general the strontium content of milk rises every year to a peak in the late spring and early summer, then declines rapidly but rises again in October, November and December. The May-June peak is consistent with the seasonal rise in fallout activity; the autumn increase is attributed to the return of cattle to the barns, where they are presumably fed silage grown during the early summer.

However, though the seasonal pattern continues, the overall strontium content in milk has declined steadily since the summer of 1959; by the end of 1960, it was down to 60% of the 1959 peak and the trend continued at least through the third quarter of 1961, the last period for which figures are available from the government.

It is worth mentioning that only at its height, in May and June 1959, did the strontium content of Canadian milk reach 25% of the permissible maximum level, calculated on the basis of lifetime consumption using the Recommendations of the International Commission on Radiological Protection.

WHEAT SAMPLING. This program was initiated after the 1958 test series, when American studies pointed to high levels of strontium-90 in wheat. In early work it had been assumed that radioactive materials could only be absorbed by the roots of plants from contaminated soil; and it had been found that only plants which normally feed on calcium also absorbed strontium.

British research, however, showed that strontium-90 could in fact be readily absorbed into growing plants through their foliage and, therefore, in a way unrelated to the normal calcium pathway. Similarly, it has been found that this "direct-up-take" mechanism accounts for most of the caesium-137 found in plants and that caesium-137 in soil tends to become fixed and unavailable to plants for root uptake.

The wheat program was taken over by the Radiation Protection Division in 1961. Samples representing nine regions of Canada's main wheat producing areas are supplied by the Department of Agriculture. Results of these analyses are not yet available.

HUMAN BONE SAMPLING. This program has operated for the past five years with the aid of hospital pathologists who supply bone samples from autopsies for an analysis of strontium-90 content. Though these samples are selected as systematically as possible according to age and population distribution, the reliability of the results is open to question. Dr. Bird is the first to admit that the strontium-90 level in the bones of a person who died from disease need not necessarily correspond to that of a healthy individual.

Nevertheless, results in adults are remarkably close to expectations based on the milk sampling program. While this level is still only a fraction of the safe maximum as defined by the I.C.R.P., it is the only sampling program where the upward curve continues right through the test moratorium.

Also, as would be expected, the strontium content of children's bones is somewhat higher than that of adults. This is the result of the active formation of new bone in children as compared with only an exchange process in adults whose skeletons are fully formed. Since the processes involved in the formation of new bone and replacement of established bone are not fully understood, specific permissible limits have not been established for children. It is considered, however, that levels so far observed are substantially less than any which might be considered as maximum permissible.

TOTAL BODY MONITOR. The latest and most up-to-date link in the division's radiation measuring system, the monitor is designed to measure gamma rays in living beings. It can, therefore, be used to record caesium-137 but not strontium-90 levels, since strontium only gives off beta, not gamma rays.

The equipment is now being installed in Ottawa.

NATIONAL FILM BOARD PHOTO

With it, the Radiation Protection Division hopes to be able to arrange a suitable program for measuring caesium-137 levels in living persons. The results should not suffer from the limitations attributed to the bone sampling program as it will be possible to restrict sampling to healthy subjects.

With this seven-pronged measuring program, the Radiation Protection Division of the Department of National Health and Welfare will, without any doubt, be capable of detecting any trends in fallout activity, whatever the form such trends might take. But supposing the system were to reveal some alarming development, what would be the next step?

There is no simple answer to this question. Action would depend upon the particular circumstances. The kind of action required in the event of very high levels of the short-lived fallout components would be entirely different from that required to deal with high levels of strontium-90 or caesium-137. The relative concentrations of the short- and long-lived components would be expected to vary greatly at different stages in their passage through the food chain.

Careful studies conducted in different countries have led to the conclusion that it is highly unlikely that fallout levels from weapons tests so far conducted will be high enough to warrant modifying normal dietary habits.

Nevertheless, the Radiation Protection Division is continuing its comprehensive study and is keeping abreast of all developments which would be of assistance in the event the situation did reach "action-required" proportions. For the short-lived components, temporary storage of certain food items which would be most susceptible to contamination is probably the best solution. For the long-lived components, (a rise in these would be expected to be much slower than for the short-lived components) various techniques are known and would be recommended for specific circumstances.

Meanwhile, the big bombs burst as the major powers have resumed nuclear testing. At this stage no one can say positively what the results to human life will be. But continuing studies such as now conducted should provide the answers which the world seeks.

* * *

First published in the June issue of *Canadian Business*.

59854-0—2½

RESOURCE EVALUATION FOR EMERGENCY PLANNING

The following article was prepared for the EMO National Digest by Dr. Joseph D. Coker, Director of the United States National Resource Evaluation Center, Office of Emergency Planning.

PLANNING implies knowledge. Planning on a broad scale requires correspondingly broad base of pertinent knowledge. Emergency planning in the Western democracies requires an especially broad factual base. This is true because of the vast array of potential emergencies which the Western democracies must be prepared to meet. We must be prepared to face emergencies of any type, in any combination or sequence, at any scale, at any time, because, as defenders, we must leave the initiative to aggressors. The full spectrum of conflict for which we must plan ranges from pure economic competition through cold war, economic war, and limited war to total nuclear war.

Such planning poses a requirement for an informational and analytical base so vast and so complex that few seem to have comprehended its size and shape even in outline form. Increases in these informational and analytical requirements for effective emergency planning bear a close correlation with advances in the technology of conflict. Prospects of meeting these expanding requirements would seem remote indeed were it not for concomitant acceleration in the development of analytical method and equipment.

In the United States, we are making determined efforts to adapt and apply technological developments in mathematical model building, data processing, computing, and systems analysis to the requirements of emergency planning. These efforts find a focus, I believe, in the National Resource Evaluation Center (NREC), in the Office of Emergency Planning, which is a part of the Executive Office of the President. Although within the Office of Emergency Planning, NREC is staffed by approximately 20 Executive departments and agencies of the federal government, its mission is to develop the best possible base for non-military defense planning and readiness, not only in the Office of Emergency Planning, but also in the other departments and agencies.

More specifically, the NREC functions include the provision of estimates for pre-attack planning for:

a. Survival operations following nuclear attack on the U.S.
b. Resource management following nuclear attack.
c. Mobilization support for limited wars, and
d. Resource allocations for:
   U.S. civilian requirements.
   U.S. military requirements.
   Allied requirements.
e. Economic stabilization.

Maintenance of a capability for post-attack estimates for the same purposes.

Provision of bases for development of a stronger nonmilitary defense posture, including:

a. Reductions in vulnerability.
b. Training and test exercises.
c. Stockpiling.
d. Maintenance of the health and flexibility of the U.S. mobilization base and especially its industrial economy.

Participation with the Department of Defense in symmetrical analyses of U.S., and allied versus potential enemy positions.

Provision, for any national purpose, of estimates of the economic and industrial impacts of changes in major public programs, and major economic, industrial or technological changes or disruptions, proposed, threatened, expected or experienced.

As a prerequisite to performance of its functions, NREC has found it necessary to develop or to have developed a variety of analytical models.

The term "analytical model" as here used means an analytical system and appropriate data for examining relationships between cause and effect in situations in which it is not feasible or economical to do more direct experimenting. By use of an appropriate analytical model it is possible to simulate almost any conceivable

activity or operation, e.g. an air battle, the effects of a nuclear attack, or even the operation of a national economy. By repeated trials or operations of the model, with stipulated changes in assumptions or parameters, it is possible to determine the sensitivity of results to changes in any of the variables in a problem or operation. Results of many trials in such controlled "experiments" can enable planners to perform their function on the basis of understanding the consequences of alternate courses of action.

Analytical models can be "operated" by hand, following routine procedures, using simple arithmetic, and keeping hand-written records. Models can become more efficient through use of desk calculators, slide rules, tables, graphs and nomographs. They can become much more sophisticated, more detailed, more dynamic, more realistic and more informative if advantage is taken of recent developments in electronic data processing, computing, display and communication devices. Such devices make possible the solution of problems so massive and so complex that fifteen years ago they would have been beyond the practical limits of human organization and integration. Many of the problems posed today by the requirements of emergency planning are of such magnitude and complexity. For this reason, most of NREC's analytical model building has involved application of electronic equipment. NREC computer models include:

- An air battle model for gaming hypothetical attacks to provide reasonably realistic patterns of weapon detonations as a basis for NREC estimates.
- A fallout model for simulation of the distribution of radioactive fallout from surface burst weapons and for estimating the fallout intensities and doses at all points of interest.
- A firespread model to simulate the spread of fires from points of initial ignition by nuclear weapons.
- Casualty models for estimating human fatalities and other casualties by cause and severity of injury.
- A time-phased casualty model for projecting the health condition of a post-attack population over time.
- A manpower model for estimating the condition and availability of manpower by occupational skill in each metropolitan area.
- Damage assessment models for estimating the post-attack condition and availability of facilities and other resources.
- A livestock model for estimating the post-attack condition and availability of livestock.
- A vulnerability or risk model for estimating the probability of various intensities of blast and radiation at particular places of interest and the probabilities of various levels of resource losses.
- A supply-requirements model for estimating and comparing survival item requirements and supplies by post-attack time period and by area.
- An inter-industry model to facilitate development of feasible national post-attack production goals and programs based on stipulated end-item production priorities and within the limits of available resources or to test the feasibility of proposed production programs otherwise developed.
- Management models to facilitate implementation of national policies and decisions concerning resources.
- An inter-industry model for estimating the geographic and industrial impacts over time of major changes in the economy, including changes in major programs such as armament, arms control, space, public works and other national programs, or changes in international trade, employment, technology, etc.
- Economics projection models to provide projections of gross national product, economic growth, employment, unemployment and activity levels in various industrial sectors for any stipulated year.

In this article I shall discuss briefly only a few of these models beginning with the damage assessment models. NREC has developed both electronic computer techniques and hand techniques for damage assessment. Whether computer methods or hand methods are used, four general types of information are required for damage assessment: (1) data on resources, (2) weapons effects factors, (3) attack data, and (4) meteorological data.

The National Resource Evaluation Center, largely through the support of participating government agencies, maintains data on almost every type of resource considered important to survival and recovery. These include detailed information on population, manpower, government, military resources, communications, transportation, fuels and energy, water systems, agricultural resources, housing, medical facilities, survival items, minerals and metals, manufacturing, financial institutions, and educational institutions.

With respect to the resources of each type at each separate location, we maintain in the NREC magnetic tape library the following kinds of resource point data: (1) resource classification which identifies the function of the facility or activity involved, (2) location in terms of geographical coordinates, (3) quantitative statements of capacity, size or other implications of importance and (4) physical vulnerability characteristics of the facility or activity at the given point.

NREC also has the following types of weapons effects factors recorded on magnetic tape: (1) blast overpressure as a function of weapon yield, height of burst and distance from ground zero, (2) similar thermal radiation factors, and (3) fallout distributions from various yields of surface burst weapons as a function of wind velocity and direction.

Information required with respect to each weapon detonation include: (1) ground zero, (2) yield, (3) height of burst, and (4) time of burst. These attack data must be provided for assessment of the effects of any hypothetical or actual attack.

Meteorological reports required from each weather station includes: (1) wind vectors (directions and velocities) at each significant level, (2) location of station, and (3) time of vector determination. Some of our Weather Stations provide meterological readings in this detail every six hours, all others every 12 hours. NREC also receives regularly the detailed 12-hour and intermediate forecasts of the U.S. Weather Bureau. In event of attack, these would be used in our preliminary estimates, along with corrections based upon station reports to the extent these continue to come in.

The first step in our detailed damage assessment procedure is to have the computer estimate the intensity of fallout on each two-minute square in which resources are situated. Such estimates are based on the forecast wind directions and velocities and formulas describing the appropriate pattern of fallout distribution.

Having established the radiation intensity at each point resulting from fallout from all weapons, the computer then arranges the results in a format which enables an electronic printer to print an outline map of the United States at 1:2.5 million scale showing fallout intensities or doses in each 6 $\times$ 10 KM square in which important resources are located.

In the next step of the damage assessment procedure, the computer calculates the distance between each of the 550,000 odd resource items presently in the NREC resource library and the ground zero of each weapon close enough to have any blast or thermal effect upon it. Then, in each case, the procedure takes into account: (1) the computed distance, (2) the yield of the weapon, (3) the height of the burst, and (4) the physical vulnerability of the specific resource to a weapon of that yield, in a burst of that type, at the computed distance. The computer thereby is enabled to place each resource in a physical damage class, i.e., "Severe Damage" (damaged beyond repair), "Moderate Damage", "Light Damage" (glass breakage and the like), or no blast damage.

At the next stage, the computer takes the same distance and weapon data, and the thermal vulnerability of each resource in order to place each resource in a "Fire Likely" class or a "Fire Unlikely" class. The fallout data as previously calculated are then associated with blast and thermal effects so that electronic printers can print out lists of all resources in all categories that may be desired. Associated with each listed item are the particular estimates of blast and thermal damage as well as radioactive contamination. Meanwhile, the computer summarizes all these effects, both by resource function at various geographic levels and edits the summaries for electronic printing, for display, and for dissemination to other locations. Associated with each type of functional and geographic breakdown are the desired summaries of quantitative data used to establish resource significance and operational capability.

High-speed machine procedures are also used in estimating casualties. Separate estimates have been entered into the NREC tape library for the population located in each of approximately 43,000 areas within the United States. In the most heavily populated portions of cities, these areas consist of only a few city blocks. Sparsely populated areas are many times as large. Fatalities and other casualties resulting from blast and other direct effects are estimated by reference to curves relating percentage of mortalities and other casualties to distance from ground zero.

Fallout casualties are based on the Equivalent Residual Doses (ERD) which is the total accumulated radiation dose minus that portion of the dose which the body is assumed to be able to repair. As initially calculated, the ERD in each area applies only to unshielded personnel. Therefore, the computer must now refer to a table of shielding factors to ascertain for each area the percentage of population expected to be protected by various levels of shielding. For each such percentage of the population of each area, the outside ERD is appropriately reduced, depending, in each case, on the assumed quality of shielding. Having estimated the net ERD, the computer refers to sickness and fatality curves relating percentage of sickness and deaths to ERD in order to estimate fatalities and other radiation casualties. All types of casualties are then summarized geographically.

Similar computation procedures, but with differing shielding factors and tolerances for blast and radiation are applied to various types of livestock.

It is generally recognized that in the case of individual facilities, computer estimates based simply on the attack pattern (i.e. ground zeros, weapon yields, heights of burst, and time of burst) will frequently be in error. Plans are being developed, therefore, to obtain

more accurate estimates (1) by detailed interpretation of post-attack aerial photographs in the cases of selected facilities—particularly those in areas which may be heavily contaminated by fallout but where comparatively little damage is sustained from blast and fire, and (2) by ground surveys of important facilities. Also, plans are being made for a post-attack census of population status on a sample basis. Computer procedures are being developed for rapid substitution, item by item, of status data based upon more accurate photo interpretations, radiation reports and ground survey estimates in place of the earlier but less reliable computer estimates based upon weapon and wind calculations.

At present, operational NREC procedures take into account damage caused by direct thermal ignitions, but they do not provide estimates of damage or casualties from spreading fires which may follow a nuclear detonation. A computation model, called "Flame", developed to estimate the extent and the effects of spreading fires is now nearing operational status.

Past developmental efforts in damage assessment have been focused largely on estimating the direct consequences of nuclear attack. Increasing attention is now being given to indirect effects. The first result of this effort is a model to estimate and compare survival item requirements and supplies.

The first step in this procedure is to use (a) the Jumbo estimates of casualties of various types as well as non-casualties, (b) dying curves for fatal casualties, and (c) recovery curves for non-fatal casualties. The casualty and non-casualty estimates in each area are then translated into a distribution of survivors by health category and by post-attack time period for each area.

The next step is to apply appropriate per capita requirements for each type of survival item to the number of survivors in each health category, during each post-attack period, for each area. Thus, we obtain estimates of the total requirement for each type of survival item, during each time period, in each area.

The third step in this survival item procedure is to develop the supply side of the equation to match these requirements. The Jumbo estimates of damage to survival item inventories and production facilities in each area are applied, along with appropriate labor productivity and other factors, to estimate the total supply of each type of survival item becoming available during each post-attack period—both from inventories and from production facilities in each area.

I wish to introduce now another model which is generating unusual interest in certain non-defense groups. This model is called "PARM" meaning Program Analysis for Resource Management. The model is being developed for us under a research contract by the National Planning Association in a project directed by Marshall Wood. It is a dynamic input-output model. It is designed for application under a wide spectrum of circumstances ranging from normal peacetime to post-nuclear attack. I shall discuss very briefly some of its uses related to the development, planning, testing, and execution of post-attack resource management programs. For example, it is designed to test the feasibility of proposed post-attack program and policy decisions by computing the time-phased implications of such decisions with respect to requirements for and availability of all important resources that might be in short supply during the recovery period. Also, the system is intended to help guide the revision of such decisions when and where necessary in order to make them feasible. Finally, the system is designed to provide blueprints for resource allocation in support of feasible programs. In each case, operation of the system involves an intimate and continuing relationship between the judgment and experience of resource specialists and the vast memory and computational capabilities of high-speed data processing, computing, and presentation equipment.

For the purposes of this model, post-attack program and policy decisions will be expressed in terms of a list of "packages" of end-item or final-demand products and services, arranged in priority sequence. Each such package will include requirements judged to be of approximately equal priority. The PARM procedure provides the necessary arrangements for determining the total time-phased direct and indirect resource requirements for the support of each "package". It will thus enable specialists readily to check such requirements against available resources, as estimated through use of the previously-mentioned damage assessment models. Finally, it will provide a direct determination of the feasibility of carrying out the programs defined by each such package.

In broad terms, the PARM procedure will operate as follows. Each package in the priority sequence will be tested in turn, considered as an addition to all preceding packages. If and when the cumulative sum of all packages through a given sequence of priorities becomes infeasible, the computer will isolate and identify the bottleneck or bottlenecks. The responsible resource specialists and managers will then be furnished summaries of remaining resources and requirements, as a basis for review and revision of the requirement packages or priorities. They may be able to achieve feasibility in various kinds of revisions, such as:

a. Modifying program quantities or time phasing;

b. Stipulating more efforts or earlier effort on decontamination, repair, or construction of production facilities, or assigning such activities a higher priority position;

c. Stipulating capacity conversions between production activities;

d. Changing the priority sequence of requirements, or

e. Permitting substitution of materials or other inputs in production processes.

The PARM model will also be used to provide bases for development of national policy and programs pertaining to areas of international competition short of nuclear warfare. PARM can thus enable us to estimate the impacts of any major change in the national economy and to consider many problems of international significance.

Particular attention must be given during peacetime or cold war to measures for strengthening and maintaining the mobilization base. Perhaps the most urgent area for consideration here relates to national policy and practice on stockpiles—to their composition, size, distribution, location, protection, and planned utilization. Attention must also be given to those national policies and programs which influence international trade, economic growth, economic stability, employment, technological development, industrial centralization or dispersal, etc. Constructive influence can be exerted by government in these areas only through awareness of the probable consequences of alternatives. It is clear that major contributions to such awareness can be gained from simulation exercises, estimates, and studies utilizing PARM and related models.

I would like to conclude this very sketchy description of PARM by noting that this mathematical model and the related computer instructions are not geared inexorably to the consideration of the total U.S. economy or to a particular time frame. The PARM model can be focused down on a region or it could look across the sea at the plight of an underdeveloped country with limited resources and an exploding population problem. It has some interesting potentialities for examining the long-range consequences of automation or the effect of major reductions in the standard work week.

In summary the National Resource Evaluation Center maintains data on almost all important resources at approximately 550,000 locations in the U.S. It has both detailed and short-cut models procedures for estimating attack damage and casualties with the help of large-scale computers. It is making considerable progress in more complex areas—particularly in the evaluation of indirect effects and in post-attack resource management. NREC has developed simplified models for gaming attacks and somewhat more sophisticated models for appraising blast and radioactive fallout probabilities, for estimating and comparing supplies and requirements, and for tracing and estimating the impact of change in the economy. Much developmental work remains to be done, however, in the general field of resource evaluation and analysis. Mere beginnings have been made in the development of capabilities to estimate (1) the effects of nuclear attacks on network targets, such as transportation, communications, electric power, and water and sewage systems, (2) the effects of biological attacks, (3) the genetic and other long-term effects of massive nuclear exchanges, (4) the effects of massive nuclear attack on continuity of government, civilian morale, and social institutions, and (5) the effects of all these on productivity. Also much developmental work is required to enable us to quantify and to place in priority order our civil and military requirements.

* * *

From the June 14 edition of the OTTAWA CITIZEN:

A Fallout Shelter, designed to accommodate 750 persons for 14 days, has been planned in an apartment building now under construction on Highway No. 17 north near Crystal Beach.

NATIONAL SURVIVAL NUCLEAR DETONATION AND FALLOUT REPORTING SYSTEM

A Report Prepared by the Directorate of Survival—Operations and Plans, Army Headquarters, Ottawa

PRIVY COUNCIL ORDER 656 of 1959 (The Civil Defence Order of 1959) charged the Minister of National Defence with the responsibility of exercising certain powers, duties and functions in connection with national survival, including:

"Determining the location of a nuclear explosion, the patterns of fallout, and giving the necessary warning of fallout to the public".

The Army was designated as the responsible agency within the Department of National Defence for the establishment and operation of the system to perform this function. As a result, the organization of the Nuclear Detonation and Fallout Reporting System, abbreviated to NDFRS, was approved and is now in the process of being established across the country.

The system was designed to fulfil (in conjunction with the National Survival Attack Warning System) three major functions:

1. To determine and report the location of ground zero, the height of burst and yield of the weapon as quickly as possible after the detonation.

2. Using the data obtained in (1) above, together with the latest meteorological information available, to prepare and disseminate a predicted probable fallout pattern plot to give the public advance warning of the likelihood of fallout.

3. To determine the actual pattern of fallout, its time of arrival and its intensity as it arrives on the ground, to amend the predicted pattern as necessary and to inform the public of the actual hazards resulting from fallout.

Unlike the National Survival Attack Warning System discussed in the Winter 1961 issue of the Canadian Army Journal, the NDFRS is not dependent on advance warning. It starts to function only after the attack has occurred, though, obviously, advance warning will ensure complete readiness of the NDFRS before the blow falls.

To fulfil its assigned functions, the NDFRS consists of the following elements:

1. NUDET (Nuclear Detonation Reporting) Posts, located in groups of at least three surrounding each of the 16 Canadian cities that have been assumed as the most likely places where nuclear detonations might occur. These posts have the primary role of determining the location of ground zero, height of burst and yield of the weapon for any strike on or near that target. They also have a secondary role of reporting subsequent fallout intensities. Each post will have direct communication to the appropriate Provincial Warning Centre (PWC) by radio with standby emergency power available. These communications probably will also be tied in with the Target Area Headquarters for the applicable city.

2. Fallout Reporting Posts located approximately on a grid of 45 miles east and west by 15 miles north and south throughout the populated area of the country and on a reduced scale outside these areas. Their primary role is determining and reporting fallout as it occurs at their location. They will also be capable of reporting with limited accuracy, random nuclear detonations that might occur outside the probable target areas due to a variety of reasons and not reportable by the existing NUDET posts. These posts will rely on existing communications, which will be tied into the most convenient system which enables the speediest transmission to the PWC.

3. Nuclear analysis prediction and plotting staffs, provided by the Canadian Army (Regular) at the Federal Warning Centre (FWC) and each PWC. They are at full strength in peace and war. Those at PWC's will receive and analyse reports from NUDET and Fallout Reporting Posts to confirm or amend predictions and distribute the necessary information to the proper authorities. They will also

prepare the isodose contour lines delineating areas and intensities of fallout and prepare suitable messages for the public. The staff at the FWC will collect, collate and display nuclear detonation and fallout information for the planning needs of senior federal government and military officials.

4. Filter Centres established as necessary and operated by military personnel to monitor reports coming in from Fallout Reporting Posts. Their locations will depend on the volume of traffic to be handled en route to the PWC, the routing of communications, and the necessity for intermediate plotting. Regular Army or Militia personnel will be earmarked and trained in peacetime but the centres will not be manned under normal peacetime conditions.

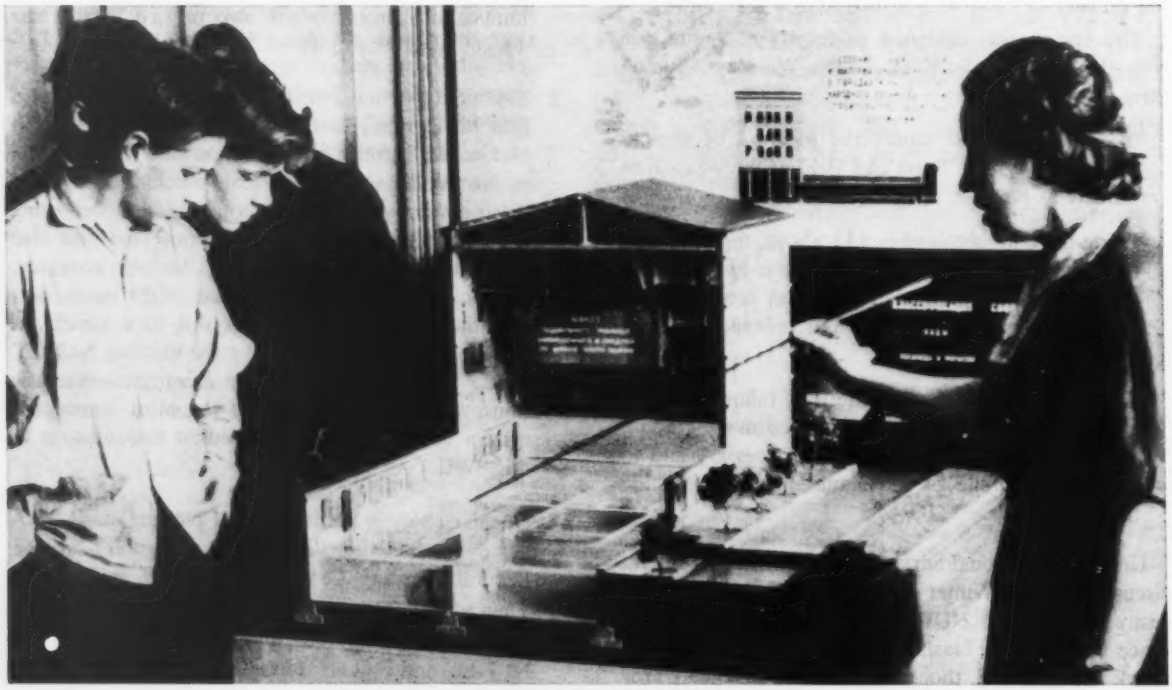
It is readily apparent that existing military installations and communications do not provide the degree of coverage and continuity necessary to fully implement the NDFRS as conceived. Our manpower and financial restrictions do not permit expansion of the Army to provide the degree of coverage and continuity necessary to fully implement the NDFRS as conceived. In the interests of economy, it is intended to make the fullest use of all existing facilities— the Army, other services, other federal, provincial and municipal agencies, and even private companies such as railways and utilities, in the establishing of the NDFRS.

Subject to suitability regarding location, communications, normal role and reliability, the priority of selection of sites for NUDET and Fallout Reporting Posts will be in the order listed above. These posts must be manned 24 hours a day, seven days a week, i.e. the personnel to be employed must be located at or near the site, be alert and readily able to fulfil their reporting role by virtue of their normal primary role.

A permanently manned security or gate guard suitably located would make a good choice. RCM Police or Provincial Police organizations are generally ideally suited for the role: their posts are well scattered over the province, are virtually permanently manned by reliable, responsible people and are tied to their headquarters by both line and a well developed radio network, which ultimately terminates in the PWC. Moreover, the police have an inherent interest in NUDET and fallout reporting in the fulfilment of their normal role.

Dissemination of warning and information from PWCs to the public will be done through the National Survival Attack Warning System.

* * *



The above photo from an official Soviet source shows one of the guides at the permanent Civil Defence Exhibition in Moscow pointing out a large basement shelter to a group of students. (UIP PHOTO)

HOME OFFICE — UNITED KINGDOM

The following statement on Civil Defence in the United Kingdom was made during a parliamentary debate by the Minister of State, Home Office, Mr. David Renton.

THIS, as has been said, is the first debate we have had for a long time in which civil defence could be discussed. We have had some very interesting speeches and some well-informed ones on that matter. They have also been strangely conflicting. Some have said that we should spend many more millions on civil defence and reach a stage of near-readiness for emergency, while others, including the hon. Member for South Ayrshire (Mr. Emrys Hughes) said that we should drop the whole thing, that it is a waste of time and money. Indeed, the hon. Member for Lanark (Mrs. Hart) went so far as to back him up by saying that it was all hypocrisy. In saying that they seemed to ignore the fact that Russia, the United States and most European countries have a civil defence policy very much like ours, in some ways more developed and in some ways less so. We keep close contact with our NATO allies in civil defence matters, and we learn a good deal from each other.

We regard civil defence as a prudent and humanitarian form of insurance against a disaster which we hope will never happen. But if it did happen, we should be thankful that we had taken steps to help the survivors and to alleviate the suffering. This year, we fixed the insurance premium at about $19 million, rising to $20 million, and, as my hon. friend the member for Manchester, Withington (Sir R. Cary), pointed out, we are continuing it at that level at least for a good many years ahead. We do not think that that is over-insuring. If anyone thinks that we are under-insuring, I suggest that he should first help us to make certain that the premium is well spent.

The hon. Member for South Ayrshire indicated that, in his view, there would be no survivors. That, I think, fairly summarises his attitude to the matter. That is not a view shared by us or by other Governments concerned. As my right hon. Friend the Home Secretary and I have pointed out on many public occasions, there would, on any reasonable assumption, be millions of survivors of the attack. It is to ensure that the maximum number of people would survive and to help to re-establish the essentials of national life after a disaster of such magnitude that civil defence in its widest sense exists.

As the Committee knows, during 1960 we carried out a comprehensive review of civil defence plans. As we explained in the 1961-62 Defence White Paper, we decided that some additional expenditure was needed to secure a better balanced programme over the next few years. Among the items to which more money is being devoted, both under the Home Office Vote and under the Votes of other Departments, are the provision of premises and communications for the emergency chain of control, the protection of water supplies, and the provision for the storage and emergency distribution of oil and emergency medical supplies. We are continuing with our plans for safeguarding supplies of food and are making emergency provisions for the functioning of ports, shipping and railways. We are continuing to stockpile radiac equipment for the essential services and we are stock-piling more fire-fighting equipment. We are providing more operational and training equipment for the Civil Defence Corps and the emergency fire service.

The hon. Member for South Ayrshire asked whether we have an office for emergency planning. Of course we have. Some countries, when they need to establish a new office, do so with a good deal of publicity and form a separate department. But our habit is sometimes to let the Home Office get on with the job. That is what we are doing.

My hon. Friend the Member for the Isle of Ely (Sir H. Legge-Bourke), my web-footed neighbour—I am sure that he will not mind my calling him that—referred to the condition in which his constituency and mine might be. He referred in particular to the number of wireless sets available for training and the facilities which exist for exercises to take place in his constituency, where there are sixty-two active members of the signals subsection training weekly in detachments at Ely, March, Wisbech and Whittlesea. There are seven sets between them. That is an allocation which, I understand, has enabled those sixty-two people to be trained adequately. Still more could be trained if necessary.

My hon. Friend the Member for the Isle of Ely and others referred to the warning and monitoring organization which, as they said, is the first essential for home defence—a reliable system of warning. It would be a short warning, about four minutes, but it would at least give people time to take cover, and this alone could save many lives.

I was glad to agree with my hon. Friend the Member for Withington when he said that our warning system was in an advanced state of preparedness. I assure the Committee that it could be brought into operation at

very short notice and it would be effective. We are improving it all the time.

All home defence measures in the event of attack would depend for their effectiveness, as my hon. Friend the Member for the Isle of Ely pointed out, on a system of command and control. We have had one in existence for some years and the many exercises which have been held show that there is excellent co-operation between our regional, subregional and area organization and the Armed Forces. Many control premises have been built for that purpose. Others have been earmarked and we have a building programme for the remainder which is gaining momentum. The whole chain of command needs special communications and our network of emergency cable and radio links is being developed very fast.

We have detailed plans for emergencies in the broadest sense and for marshalling and co-ordinating essential supplies and services after a period of attack. The aftermath would be a struggle for survival in which the entire remaining resources of the country would have to be used. We have the most comprehensive arrangements for ensuring that all necessary services are provided for in these emergency plans.

My hon. Friend the Member for Keighley (Mr. Worsley) asked about recruiting. I am glad to say that the last recruiting campaign was the most successful we have had and the total strength of the civil defence services, including the Royal Observer Corps, is now about 650,000, including 375,000 members of the Civil Defence Corps. There are two good things about these figures. First, they probably include a higher percentage of effectives—that is, trained people who are taking a genuine and active interest in things—than for many years past. Secondly, recruiting has continued at a good rate since the last recruiting campaign ended. I am sure that the Committee would wish to join me in expressing our thanks to all those who volunteer for this most valuable service to the country.

In paragraph 49 of the last Defence White Paper we announced our intention to discuss with local authorities certain changes in the organization of Civil Defence Corps and the Auxiliary Fire Service. Our main purpose is to improve their effectiveness to form a trained nucleus for quick expansion in an emergency. We are discussing these proposals with the local authorities. My hon. Friend the Member for Withington wanted to know about the co-operation of the Territorial Army. He rather indicated that there was very little. Without troubling the Committee with details, I will merely say now that there is a great deal and has been for years. I will write to my hon. Friend about the details.

As to shelter, it is generally accepted here and in other countries that the need is to concentrate on protection against fall-out, which is quite easy to obtain, rather than to consume resources on protection against blast and fire. As I said in reply to the hon. Member for Leeds, South-East (Miss Bacon), a basement or any other kind of underground shelter gives a high degree of protection and much can be done by taking advantage of existing buildings. Management of industrial premises were invited some time ago to survey their premises with a view to providing fall-out shelter and were given technical advice to help them in doing so.

In our Statement on Defence this year, we explained that we had reviewed dispersal policy in the light of recent developments in the strategic situation, and announced that we had decided to prepare a dispersal scheme. This would be a voluntary scheme under which priority classes, mainly women and children, would move from large centres of population to reception centres. The local authorities have been sent information about the outline of the scheme, and the next step is to work out the details, on which we shall, of course, consult them.

My hon. Friend the Member for the Isle of Ely and other hon. Members referred to the important question of giving advice to the public. A good deal of information has already been made available to those who want it, but we agree that this is not enough, even when we take account of the splendid work which the W.V.S. has done in the one-in-five scheme, and what the local authorities are doing. We have plans for the rapid issue, in an emergency, of instructions to householders on the physical preparations they should make, and we are considering how to increase the information given meanwhile to the public.

It is sometimes said—and said sometimes, if I may say so without being offensive, by people who ought to know better—that the Government are not giving enough of a lead in civil defence, but I hope that I have shown clearly that we are giving a lead, not merely by words but by deeds. We are bringing our policy and plans up to date. We are spending large sums of money, building more headquarters, control rooms and local training centres. We are providing more and more equipment and improving our reserves of food and materials, besides encouraging recruitment through our autumn campaigns and, speaking for my right hon. Friend and myself, encouraging volunteers, officials and civil defence committees whenever we have the chance to do so. If those things do not amount to giving a lead, I should be glad to be told what does.

HOSPITAL EXPERIENCE PROGRAMME FOR SELECTED HOME NURSING TRAINEES

by

EVELYN A. PEPPER, *Nursing Consultant,*
Emergency Health Services.

Introduction

THE Home Nursing Training Programme conducted across Canada by the St. John Ambulance Association and the Canadian Red Cross Society is proceeding well. Since 1957, 65,000 women and a modest number of men have taken these courses which include simplified nursing techniques. In addition, the trainees are informed regarding our country's planning for emergency action to meet any type of disaster. Consequently, more and more Canadians are being prepared not only to provide simple care for the sick at home, but also to assist doctors and nurses to treat the sick and injured in the event of a disaster.

The objective of the Home Nursing Programme is to train one member in every Canadian family. Registered nurses across the country are giving unlimited support to help the two agencies to meet their objective. During the past year, these nurses gave over 60,000 hours of teaching on a voluntary basis to this programme. This indicates that nurses who are thinking in depth regarding their responsibility to their community are anxious to assist in family planning for illness or injury at home or disaster in our country.

New Programme

As an adjunct to the Home Nursing Programme, a "Hospital Experience Programme" made up of 44 hours of supervised in-hospital experience has been initiated by Emergency Health Services in conjunction with the St. John Ambulance Association and the Canadian Red Cross Society. This programme is restricted to highly selected Home Nursing trainees. Each trainee must have had the 24 hour well organized training course in Home Nursing which includes classroom instruction, administration and supervised practice of simple home care tasks which can be assumed on doctors orders, in the home. Each group-in-training consists of not less than eight and not more than 12 persons. Selection of candidates for this hospital experience is made on the recommendation of the nurse instructor of the general Home Nursing course and the nurse examiner where applicable. All candidates in the Hospital Experience Programme must be enrolled as volunteers in their local Civil Defence and/or Emergency Measures Organization.

Objectives

The prime objectives in conducting this type of programme are

(a) to increase the number of lay people available to assist doctors and nurses in Existing and Emergency Hospitals during a disaster;

(b) to provide well-trained trainees who will give voluntary service to their community hospital in normal times.

Duration of Course

The course should cover morning, afternoon and evening patient care. Following a period of experimentation within Sunnybrook Hospital, the following timetable has been suggested:

Saturday from 2 P.M.—6 P.M.
Sunday from 8 P.M.—12 P.M.
Tuesday from 7 P.M.—10 P.M.

Time-tables, however, should be very flexible and adjusted to suit the hospital and the trainees. The full course is best conducted over a period of four weeks.

Programme Supervisor

To ensure the safe conduct of the programme from the standpoint of the patient, the hospital and the trainee, monies are available for the employment of a nurse supervisor for each group under training. The fee for this supervised instruction is provided for through the Financial Assistance Programme. The

Outlined below are the areas of procedure and observation to which the trainees are exposed during their in-hospital supervised experience.

Procedure	Satisfactory Practice	Observation or Orientation	Yes	No
Bed-making, use of pillows, back rests, etc.		*Observation of the following:* Pain		
Morning, afternoon and evening care		Shock		
Bed baths for chronic or convalescent patients		Hæmorrhage		
Turning of patients, care of backs, relief of pressure points		Burn		
Feeding helpless patients		Paralysis		
Giving simple treatments: Hot water bottles, ice bags, ice collars		Chill		
Giving bed pan		Contusion		
Care and listing patients' clothes		Difficult breathing		
Care of Patients' Unit on discharge		Unconscious patient		
Assisting in the care of Patients in Plaster Casts		Simple enema		
Methods of cleaning and care of equipment		Medications by mouth		
Preparation of supplies (in a Central Supply Room where possible)		*Orientation* to such advanced nursing producers as: Oxygen therapy		
Lines of communication in the hospital		Blood Transfusion		
		Gastric Suction		

choice of a suitable nurse supervisor should be the prerogative of the Director of Nursing of the hospital providing the experience. To date some Directors of Nursing have preferred to delegate the supervision of the trainees directly to their Head Nurses, on the basis of one trainee to each ward. Each Head Nurse, in turn, assigns the volunteer-in-training to work and observe directly under the supervision of a qualified nurse on the ward. These two persons work together and in this way the simple safe tasks which the volunteer-in-training may assume are delegated and constantly supervised. In such cases, no fee is paid for supervision as the responsibility is shared by many qualified nurses rather than a programme supervisor.

Volunteer Service Only

It must be clearly understood that a new labour force is not being created through this programme. The persons who take this training are public-spirited citizens who wish to make a voluntary contribution in time and service to their community hospital now. Also, they want to be better prepared to assist if a greater need for their help arises. Through experience it has been learned that well-trained volunteers have a significant role to play in disaster situations. Willing workers will report to hospitals in droves if the need arises. Through bitter experience, however, it has been demonstrated that unless the willing volunteers have been previously oriented to and have worked within a

hospital, they are of little use to the organization in a stress situation.

Civil Defence Insignia

In many of Canada's hospitals to-day women so trained are giving freely of their service. If you were to ask one of these volunteers how she obtained her training, she would point proudly to a small blue and gold pin which she wears on the label of her uniform or smock. Inscribed on the pin are the initials "C.D."

Conclusion

This is a new programme. Perhaps it would be more correct to call it a community health project. The sequence of events leading to in-hospital training is simple. The St. John Ambulance Association and the Canadian Red Cross offer the community their courses in basic Home Nursing; the local hospital offers its facilities for additional training, experience and observation; eight to twelve highly recommended and carefully selected Home Nursing trainees enroll for civil defence service and the in-hospital programme; the local Medical-Officer of Health approves the project which is then forwarded for ratification by the provincial and/or Emergency Measures Organization, as well as the Provincial Director of Emergency Health Services' stamp of approval; the decision is made as to who will supervise the trainees and the Director of Nursing initiates the programme. This is truly a combined effort. It is indicative of the type of public service so vital to the success of our country's preparedness plans.

* * *

Dispersal Plans for England and Wales

UNDER the Government's C.D. dispersal scheme, details of which have been circulated to local authorities in England and Wales, people would move on a voluntary basis from certain dispersal areas to reception areas in parts of West England, South-east England and Wales.

A circular issued on 29th March by the Ministry of Housing and Local Government states that in the dispersal areas there are about nine and a half million people in the priority classes—representing about 43 per cent of the total population of those areas.

List of Priorities

1—Children under 15 travelling with their mothers or, in exceptional circumstances, either accompanied by another responsible person or unaccompanied.

2—Other children under 18 who are still at school full-time, either accompanied by their mothers or unaccompanied or, in exceptional circumstances, accompanied by another responsible person:

3—Adolescents who have left school and are under 18, unaccompanied or, in exceptional circumstances, accompanied by their mothers or another responsible person;

4—Children under 18 resident at schools, homes and other similar establishments, travelling in organized parties;

5—Expectant mothers; and

6—People who are blind, crippled or aged and infirm, and who are dependent on the care of someone in one of the other priority classes in the scheme.

The circular states that in the light of developments in the strategic situation in recent years the Government has carried out a review of dispersal policy and has had discussions with local authority associations.

"As stated in the White Paper on Defence, published on February 20, 1962, the Government have concluded that a scheme should be prepared for dispersing people in priority classes from major centres of population.

"It is not their view that in an emergency dispersal would necessarily be put into operation; no one can foresee whether this would be the right course to adopt in the conditions at the time.

"But there would not even be the choice whether or not to carry out dispersal if no scheme had been planned in advance. So that such a choice could become available, the Government think it is right that a scheme should be prepared."

Dr. Hill, Minister of Housing and Local Government, is to consult with local authorities about detailed arrangements for the scheme's operation.

EMERGENCY FUEL IN SHELTERS

by

DR. N. B. HUTCHEON

Dr. Hutcheon is the Assistant Director of the Division of Building Research in the National Research Council. Under Dr. Hutcheon's supervision, conditions in fallout shelters in winter and summer have been studied by NRC. His article deals with the effects of various fuels within such an enclosed space.

THE GOVERNMENT OF CANADA authorized in 1960 the publication and distribution of the booklet *Blueprint for Survival No. 1* containing a recommended design of basement fallout shelter. This booklet also contains recommendations on the supplies which are to be stocked in preparation for shelter occupancy in an emergency as well as on some of the procedures to be followed. It was necessary in the course of the planning for this booklet which was carried out by a special Shelter Panel to give careful consideration to the shelter climate which would be provided in an emergency under Canadian conditions since this obviously had implications not only for the operation and supply but also for the design of the shelter itself.

Initial calculations and estimates indicated that many basements would experience temperatures below freezing during a two-week shutdown of the normal heating services under winter conditions. It was estimated that the heat from the occupants would raise the shelter by from 10 to 12 degrees above basement temperature, with ventilation rates at 5 to 6 cubic feet per minute per person. The conditions in the shelter though not necessarily unbearable would be well below the recommended minimum temperature of 50°F for those areas of Canada having daily minimum winter temperatures falling to —20°F or lower for more than a day or two at a time. It was concluded that serious consideration would have to be given to the provision of emergency heating of some kind.

Consideration was then given to cooking. Since it was to be anticipated that electric power supplies would be cut off it was necessary to consider the provision of some means of heating food and of boiling water for hot drinks and for other purposes. The amounts of fuel that might be required were not inconsiderable and would have to be provided in some safe and economical way. It was thought that many people might, in the absence of recommended means of cooking, use gasoline camp stoves, which they might then continue to use for heating, at some considerable risk to themselves.

It was the problem of lighting, however, which together with the other considerations finally forced the decision to use a liquid fuel. Study of the feasibility of providing lighting from batteries indicated very quickly that it would be difficult to provide more than about 1 watt of power without large and costly battery storage capacity together with means of maintaining batteries charged in storage in readiness for an emergency. The illumination possible from such a limited power supply would be totally inadequate for any group recreational or entertainment activities, and even inadequate for some essential tasks.

The one fuel which, after much consideration, seemed to satisfy best the multiple requirements of heating, cooking and lighting, combined with good storage properties, economy and safety was kerosene. The appliances for burning kerosene, though not now as commonly available as they were in former days, are relatively inexpensive. Gasoline was ruled out because of its poorer storage properties, and increased hazard in storage and in use. Appliances for burning gasoline, though more commonly available, are usually of the pressure type having low fuel capacity. These were considered to be more hazardous, particularly in relation to frequent refilling of hot appliances in the restricted space of a shelter.

Estimates of the amount of fuel required indicated that as much as 100 lb or about 10 gallons of kerosene might be required for all purposes for a two-week period. Most liquid fuels regardless of type will produce about the same amount of heat per pound. This would provide up to 5000 Btu per hour for heating which would in most cases be adequate to maintain

shelter temperatures well above 50°F under all but the most severe winter conditions. The storage of this amount of fuel and the provision of the necessary appliances was considered to be both practical and relatively inexpensive. Small liquid fuel cooking devices burn about half a pint or half a pound per hour so would require about 1½ gallons for operation 2 hours per day over two weeks. Lamps and lanterns produce about 700 Btu per hour of heat and would require about 1½ gallons for continuous operation over the full period.

Portable liquefied petroleum gas units had to be ruled out for general use on the basis of cost and of the limited amounts of fuel provided. One 100-lb tank of liquefied propane would be required for the period. The tank and fittings would have to be purchased outright and special precautions would have to be observed in protecting the tank and fittings under long-time storage outdoors as well as under periods of emergency. Fuels of furnace oil grade which might already be available in tanks in houses heated by oil are difficult to burn cleanly, in simple appliances without electric power to operate burners, and cannot readily be adapted to cooking and lighting. Stove oils already in use in oil heating could be burned in oil heaters provided these were vented to chimneys or to outside, but could not readily be used for cooking or lighting in simple appliances in the confined space of a shelter unless they were of kerosene grade.

The decision to recommend storage of kerosene for use as an emergency fuel was a difficult one. The advantages of an emergency fuel had to be weighed against a possible increase in fire hazard resulting from the operation of a multiplicity of fuel-burning appliances in an emergency when normal fire fighting services might not be available to prevent the spread of fire from one dwelling to another. Even so this calculated risk was considered to be justified in the interests of greater acceptance of shelters, and to forestall the indiscriminate use of less suitable fuels and appliances in the absence of any recommended provisions for lighting, heating and cooking. There is, finally, some advantage in having a fuel and appliances on hand for lesser emergencies such as power failures, which have in recent years deprived communities of the means for lighting, cooking or heating for periods of several days under winter conditions. The decision to recommend storage of kerosene for emergency fuel has raised many further problems which are now under study. These include the specification and procurement of proper grades of fuel and suitable appliances, and storage, venting and ventilation requirements. Further instructions supplementing those already issued to the public will be made available through Civil Defence channels as these problems are resolved.

* * *

SOVIETS URGE CIVIL DEFENCE POST

Moscow

A Russian defence expert said today that the Soviet civil defence program is functioning vigorously, but experiencing "serious shortcomings."

Gen. Dmitri D. Lelyushenko called for the "mobilization of all forces" to overcome the faults. He urged more civil defence education in schools, factories and farms.

Lelyushenko gave his appraisal of the program to the fifth congress of the Voluntary Society of the Army, Air Force and Navy (DOSAAF). He is chairman of the society's central committee.

THE IMPORTANCE OF HOUSEHOLD FOOD STOCKPILING

Emergency Supply Planning Branch
Department of Defence Production

IN NORMAL TIMES food is readily available to the population at numerous retail outlets, particularly in urban areas, and a well-established network of distribution facilities ensures a constant supply of food from producer to consumer. Similarly, there is in peacetime a reliable distribution system for the supply of the various forms of energy used in the preparation and cooking of food.

In the event of nuclear attack, however, large stocks of food supplies would likely be destroyed physically and the peace time distribution systems would be seriously disrupted in all probability. Moreover, since a nuclear explosion could blanket a substantial area many miles downwind of the target with dangerous radioactive fallout, many people would not be able to obtain food or water from regular sources for days or weeks without overexposure to radiation. Consequently, it must be anticipated that the survivors of a nuclear attack in many parts of the country would have to rely on such reserves of food and water as they might have in their homes for a period of days or even weeks following the attack.

Food does more than just keep people alive; it keeps them willing to live. It relaxes the nerves and promotes physical and mental stability; and food, apart from its purely life-giving properties, would play a vital role in maintaining morale.

Canada is rich in food resources, and large food surpluses are stored across the continent. But with the disruption of transportation after nuclear attack, there might be considerable lapse of time before distribution of essential resources from areas of surplus to areas of need could be established by the War Supplies Agency. Hence, households should be prepared to support themselves for a minimum of 14 days after attack.

It is planned that the War Supplies Agency would introduce an elementary rationing system on a local basis at an early stage of the post-attack period, wherever it might be possible to do so, to conserve local food stocks until additional supplies could be brought in, but in the best of circumstances this would take time and the amount of the food ration initially would probably be at a bare subsistence level. Household food stockpiles accumulated in peacetime would not only serve to augment such food supplies as could be made available to consumers in the early post-attack period but they would also contribute substantially to the orderly introduction of rationing by reducing the worry of families and individuals about food shortages and thus lessening the dangers of panic.

* * *

From the June 11 edition of the Victoria (B.C.) TIMES:

Basement locker rooms in the one million dollar apartment development on the Oak Bay seafront will be supplied with blast doors, exhaust fans, kitchen & bathroom facilities to make them effective bomb and fallout shelters.

The Civil Defence Director for the City of Halifax arranged to have the notice which appears below inserted in the telephone directories for Nova Scotia.

NATIONAL SURVIVAL
IS *Everybody's* BUSINESS

BE PREPARED

KNOW THE WARNING AND WHAT ACTION TO TAKE

The ALERT — a steady note on the sirens for three minutes. It means that an attack is possible or radioactive fallout from an attack elsewhere is expected. Turn on your radio; and while one member of the family listens for instructions, the others should proceed with household preparations. DO NOT USE THE TELEPHONE.

TAKE COVER—a rising and falling note on the sirens for three or more minutes. It means there is danger of an immediate attack. Take cover immediately and listen to the radio.

HAVE SOME SHELTER TO GO TO AND FOOD SUPPLIES FOR A WEEK OR MORE.

HAVE EQUIPMENT FOR COOKING AND AN ADEQUATE SUPPLY OF CLOTHING AND BEDDING AVAILABLE TO MEET ANY EMERGENCY. YOU MAY NEED SPECIAL FOOD FOR INVALIDS AND BABIES- AND DON'T FORGET TO PROVIDE FOR SANITATION.

KNOW THE EFFECTS OF NUCLEAR WEAPONS AND RADIOACTIVE FALLOUT.

KNOW EMERGENCY CLEANLINESS AND HOW TO GET RID OF RADIOACTIVE DUST.

KNOW FIRST AID AND HOME NURSING.

KNOW HOW TO PREVENT AND FIGHT FIRES.

KNOW YOUR MUNICIPAL PLAN.

HAVE A PLAN FOR YOUR FAMILY.

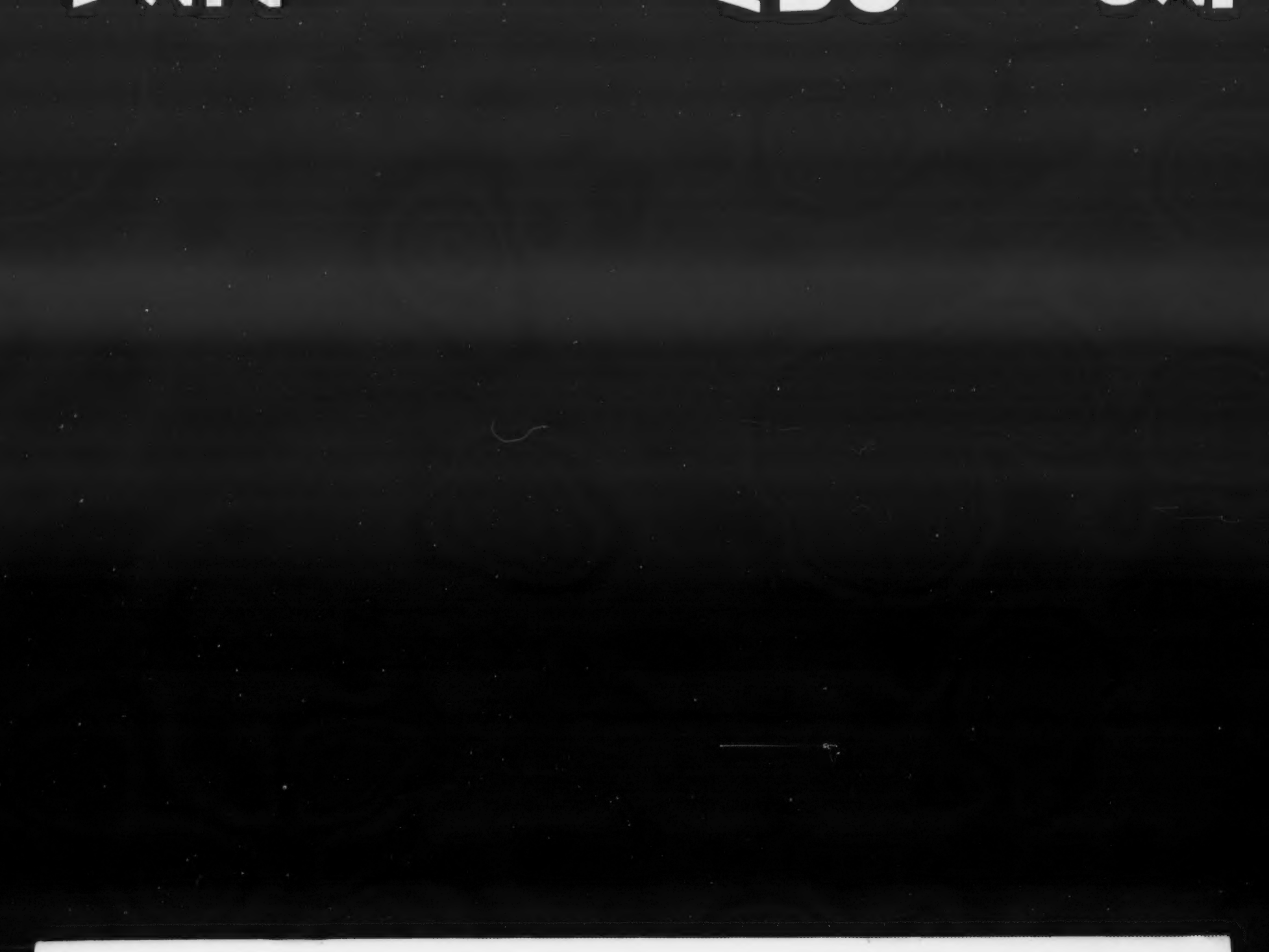
WHAT TO DO NOW

CIVIL DEFENCE IS SOUND INSURANCE

OFFICIAL POSTAL FRANK

R. B. Bryce

PRIVY COUNCIL OFFICE

If undelivered return to :

EMERGENCY MEASURES ORGANIZATION
Office 420, Daly Building,
Ottawa, Canada